# Did Cigarette Vouchers Increase Female Smokers in China?

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**Background:** From 1960 to 1980, a voucher was required to purchase cigarettes in China. The Chinese government issued vouchers to ration cigarettes, without informing its citizens that smoking was unhealthy. These vouchers were available to all adults, and allowed them to purchase specified numbers of cigarettes. As a result, a number of nonsmokers started smoking during the voucher period.

**Methods:** This study included 229 female and 1165 male smokers from the China Health and Nutrition Survey 1989–2006, which provides the year in which each respondent began smoking. The percentages of male and female smokers who started smoking during the voucher period were compared using the chi-square test. Logistic regression analysis was used to study the relative risk of smoking initiation by women during the voucher period, while adjusting for confounding variables.

**Results:** During the voucher period, 46% of female smokers and 39% of male smokers started smoking ($p=0.05$). Women who did not have a regular job or were less educated were more likely to start smoking. The relative risk of female smokers to have initiated smoking during the voucher period was 4.75, with a $p<0.01$ in the logistic regression.

**Conclusions:** China's policy of issuing vouchers to ration tobacco consumption had the unintended consequence of encouraging smoking, particularly among women. Issuing cigarette vouchers to every adult, combined with the inexpensive prices of cigarettes, led more women to initiate smoking. Women with low SES were particularly likely to initiate smoking.
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## Introduction

In 2006, 360 million Chinese were cigarette smokers.[1] By that time, China had the largest cigarette smoking population in the world, one third of the world's smokers.[2,3] China had 20% of the world's population, but consumed 31% of the world's tobacco.[4] The prevalence rates of smokers in China were 61% for men and 7% for women in 1984, 67% for men and 4% for women in 1996, and 66% for men and 3% for women in 2002.[5–7] It has been estimated that one- third of male smokers in China would eventually die of tobacco-related diseases.[8,9] At least 50% of nonsmokers in China were regularly exposed to secondhand smoke,[1] and most of them were women.[10]

The economic burden of smoking in China was approximately $US 5 billion in 2000.[6] Tobacco smoking was responsible for 10 million disability-adjusted life years (DALY) in China and ranked third in leading risk factors after high blood pressure and alcohol use.[11] Even if most Chinese smokers knew that smoking cigarettes was harmful for both them and those around them, very few wished to quit smoking.[12] In addition, 37% of currently-smoking physicians reported having smoked cigarettes in front of their patients.[13]

In 2006, China produced 43% of the world's tobacco products, making it the largest tobacco producer in the world.[4,5] In that same year, the Chinese government earned more than $US 30 billion in revenue from the tobacco industry, accounting for approximately 8% of its total government revenue.[1,14] Almost all tobacco manufacturers in China at that time were fully state-owned enterprises, and sales of domestic and imported tobacco products were monopolized by the State Tobacco Monopoly Administration through the China National Tobacco Corporation.[1] The tobacco industry also provided a wide range of employment opportunities.

The huge smoking population and great quantity of tobacco consumption indicate the need for the study of tobacco control policies in China. One of the greatest

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challenges facing China is that tobacco control is both an important health issue and an economic issue. Even when the harmful effects of smoking were understood, local and central governments were reluctant to strengthen tobacco control policies, given the tax revenue and employment generated by tobacco. Indeed, until 2007, China had no restrictions in place to ban smoking in public areas, and most restaurants and bars had not yet designated separate smoking and nonsmoking areas.

Fortunately, China has tried to strengthen its tobacco control policies by banning tobacco advertisements, requiring tar-level and warning labels on tobacco products, prohibiting the sale of cigarettes to teenagers, and moving toward smoke-free environments.[15] China also ratified the WHO Framework Convention on Tobacco Control in 2005.[14]

Earlier efforts to control tobacco consumption included approving a public notice entitled "On the Hazards of Smoking and Tobacco Control Advocacy" for the State Council in 1979.[15] China held its first "No Smoking Day" in 1987 and set up the National Tobacco Control Office in the Chinese Center for Disease Control and Prevention, which coordinated all tobacco control work.[15] Three major reasons thought to promote smoking initiation in China are curiosity, peer pressure, and the need for social interaction,[7] but economic incentives created by government regulations may also have played an important role.

The present study seeks to examine one such regulatory effort that China implemented to control tobacco consumption. In 1960, China started its rationing system for food and industrial products necessitated by the Great Famine of 1959–1961,[16] and continued using this system until the 1980s. A supply booklet was issued to each household and included various vouchers ("Piaozhen" in Chinese) for food and industrial products. Both vouchers and money were required to purchase those goods, and vouchers were issued to each household according to the ages and numbers of household members. From 1960 to 1980, cigarette vouchers were also issued and were required for purchasing cigarettes in China.[17] In the midst of this crisis situation, the Chinese government did not anticipate that cigarette vouchers might have the unintended effect of inducing more people to initiate smoking.

Cigarettes were very inexpensive, and the government issued cigarette vouchers along with other vouchers used to ration daily necessities. The hope was that by rationing cigarettes, tobacco consumption would be controlled, allowing the Chinese government to allocate more of its scarce resources to the production of daily necessities instead of cigarettes. Because cigarette vouchers were issued to every adult, as were vouchers for other products, cigarettes were regarded as valuable goods. Moreover, the adverse effects of smoking were often ignored. Women in China did not have a tradition of smoking cigarettes. Even if women were particularly susceptible to initiate smoking, the proportion of female smokers was still lower than that of male smokers due to gender-specific differences in income, employment, opportunities, peer effects, and cultural factors.

The present study examines how this regulation affected smoking initiation, particularly among women. More specifically, it considers the period in China between 1960 and 1980, during which cigarette vouchers were issued and required for purchasing cigarettes.

## Methods

This study included 229 female subjects and 1165 male subjects from the China Health and Nutrition Survey (CHNS, 1989–2006) maintained at the Carolina Population Center at the University of North Carolina Chapel Hill as a secondary data analysis. The CHNS is an ongoing international collaborative project of the Carolina Population Center, the Chinese National Institute of Nutrition and Food Safety, and the Chinese Center for Disease Control and Prevention. The CHNS was developed to promote the study of the effects of social and economic changes in Chinese society on health and nutrition. A multistage, random cluster process was used to draw the sample surveyed in each of the provinces. The provincial capital and a lower-income city were selected when feasible. China has 31 provinces or province-equivalent administrative areas, and the CHNS includes nine of these provinces. China still does not have a nationwide survey of all provinces. Counties in the nine provinces were stratified by income (low, middle, and high) and a weighted sampling scheme was used to randomly select four counties in each province. The survey included an adult sample and a child sample; our study used the adult sample. The respondents were surveyed face-to-face, and the survey language was Mandarin Chinese. The CHNS was fielded by an international team of researchers whose backgrounds include nutrition, public health, economics, sociology, Chinese studies, and demography. The present study used WHO standards to define cigarette smokers as people who had ever smoked continuously for at least 6 months sometime during their lives or were smoking tobacco products at the time of the survey.[18]

Cigarette vouchers were issued only to individuals who were at least 16 years old. Subjects in our study were at least 16 years old in 1960, when China began issuing cigarette vouchers. This age restriction ensured that every subject experienced the full voucher period. The present study compared percentages of cigarette smokers, percentages of smokers who started smoking during the voucher period, and other confounding variables between male and female subjects. This study employed bivariate analyses (using *t*-tests for continuous variables and chi-square tests for categoric variables) and multivariate analyses (using logistic regressions). STATA version 9.2 was used for all statistical analyses. Although cigarette vouchers were used as a tobacco control policy from 1960 to 1980, China did not collect any survey data on smoking behavior during this period. The first survey related to tobacco consumption

was not completed until 1984.[7] Therefore, the present study could only control for historic confounding variables. In addition to age and gender, the analysis controls for socioeconomic status (SES). Socioeconomic factors included educational attainment and ever having held a regular job. The multivariate analysis also interacted SES measures with gender to determine whether gender-specific smoking initiation rates differed by SES.

## Results

Table 1 compares smokers by gender. Approximately 45.90% of female smokers and 39.06% of male smokers started smoking during the voucher period. The rates of smoking initiation during the voucher period were statistically different between male and female smokers, with a $p=0.05$ according to the chi-square test. In addition, compared to male smokers, more female smokers had never held a regular job, were less educated, were older in 1960, and were older at the age they started smoking cigarettes. These differences are highly statistically significant.

Table 2 examines smokers who started smoking cigarettes during the voucher period. Compared to male smokers, female smokers were less likely ever to have held a regular job ($p<0.01$), were less educated ($p<0.01$), older in 1960 ($p<0.01$), and older at the age they started smoking cigarettes ($p<0.01$).

The results of the bivariate analyses presented in Tables 1 and 2 support the hypotheses that a higher percentage of female smokers started smoking during the voucher period, and that this behavior was also associated with low SES for women, as measured by job status and education. The average age of female subjects who started smoking cigarettes during the voucher period was 28 in 1960, and the average age at which these female subjects actually started smoking cigarettes was 37 years.

Although suggestive, the bivariate results presented in Tables 1 and 2 do not adjust for confounding variables. Table 3 provides multivariate evidence from logistic regression analysis. The dependent variable equals 1 if a subject started smoking during the voucher period and 0 otherwise. To test for potentially different effects of employment and education on male and female smokers, these variables were interacted with gender.

As Table 3 indicates, the odds ratio for initiating smoking during the voucher period for women was 4.75 with a $p<0.01$. This indicates that the probability of a female smoker initiating smoking during the voucher period was 4.75 times that of male smokers. The logistic regression also reveals that subjects who were older in 1960 were less likely to start smoking during the voucher period.

For men, job status is unrelated to smoking initiation. In contrast, the interaction term between female smokers and our job status measure is 0.31 and statistically significant at the 1% level. This indicates that women who had ever held a regular job were 69% less likely to start smoking during the voucher periods, compared to women who had never held a regular job. In addition, the odds ratios on the educational attainment indicators are >1, indicating that more education increased the odds of initiating smoking during the voucher period for men. The odds ratios of the interaction terms between female smokers and education dummies are each <1, and highly statistically significant. These interaction effects show that better-educated women were less likely to start smoking during the voucher period than less-educated women.

## Discussion

The present study finds that a significantly larger percentage of female smokers initiated smoking cigarettes during the voucher period than did male smokers, and that smoking initiation rates were particularly high among low-SES women. Women in China did not have a smoking tradition prior to the use of cigarette vouchers. An unintended consequence of tobacco control policy in China, however, was that cigarette vouchers led more people to start smoking cigarettes, particularly women. When the Chinese government issued cigarette vouchers to every adult, this unintended consequence was not considered. The cigarette vouchers were free, the prices of cigarettes were low, and the Chinese government did not inform people that smokers might suffer from tobacco-related diseases and, if women smoked during pregnancy, their children might be affected as well.

**Table 1.** Comparisons between female smokers and male smokers

| Sample | Cigarette smokers | | |
|---|---|---|---|
| **Gender (Sample size)** | **Female (N=229)** | **Male (N=1165)** | ***p*-value[a]** |
| Started smoking during the voucher period | 45.90% | 39.06% | 0.05 |
| Age in 1960 | 29.52 (8.64)[b] | 26.69 (8.42) | <0.01 |
| Age at smoking initiation | 33.18 (12.49) | 24.55 (7.92) | <0.01 |
| Had a regular job in any part of lifetime | 27.51% | 62.49% | <0.01 |
| **Education level** | | | |
| Less than primary school | 79.48% | 45.75% | <0.01 |
| Primary school | 13.97% | 25.92% | <0.01 |
| Lower-middle school | 3.93% | 13.91% | <0.01 |
| Upper-middle school | 2.62% | 9.53% | <0.01 |
| College | 0.00% | 4.89% | <0.01 |

[a]Student's *t*-tests for continuous variables and $\chi^2$ tests for categoric variables
[b]Standard deviations for continuous variables are reported in parentheses.

**Table 2.** Comparisons of female and male smokers who started smoking during the voucher period

| Sample | Smokers who started smoking cigarettes during the voucher period | | |
|---|---|---|---|
| **Gender (Sample size)** | **Female (N=105)** | **Male (N=455)** | ***p*-value[a]** |
| Age in 1960 | 27.99 (8.28)[b] | 21.28 (4.98) | <0.01 |
| Age at smoking initiation | 37.32 (9.92) | 27.77 (6.87) | <0.01 |
| Had a regular job in any part of lifetime | 26.67% | 73.85% | <0.01 |
| **Education level** | | | |
| Less than primary school | 76.19% | 32.75% | <0.01 |
| Primary school | 16.19% | 29.23% | <0.01 |
| Lower-middle school | 3.81% | 18.24% | <0.01 |
| Upper-middle school | 3.81% | 12.74% | <0.01 |
| College | 0.00% | 7.04% | <0.01 |

[a]Student's *t*-tests for continuous variables and $\chi^2$ tests for categoric variables
[b]Standard deviations for continuous variables are reported in parentheses.

This study sheds light on why women in China have tended to initiate smoking at older ages and why the prevalence of cigarette smoking has declined in China over the last 30 years.[5–7] Most surveys have found that female smokers started smoking cigarettes at relatively older ages, compared to male smokers in China.[19] The use of cigarette vouchers may help to explain, at least in part, why female smokers have tended to initiate smoking at older ages, compared to male smokers in China. Prior to the voucher period, few women in China smoked at any age. But a higher proportion of adult women than adult men started smoking during the voucher period. These vouchers could not affect smoking initiation among nonadults, who did not receive them. Moreover, the rescission of vouchers as of 1980 may help to explain why smoking rates have declined among Chinese women during the last 30 years. These results also highlight the long-term effects of tobacco policies on smoking behavior. Due to social and cultural factors, smoking is low among Asian women.[7] Cigarette vouchers may have reduced these barriers to smoking among women, by "legitimizing" cigarettes as a government-supported commodity. Thus this study hypothesizes that a higher percentage of women than men initiated smoking during the voucher period. Given the generally lower SES of women in China during this period, vouchers were a stronger financial incentive for them to initiate smoking. Men in China were also affected by the cigarette voucher policy, but because many men would initiate smoking regardless of any vouchers, the effects of cigarette vouchers on men were relatively smaller than on women.

The present study has several limitations. First, no survey data were collected during the voucher period, so this study could not control for socioeconomic variables such as income, household size, and occupation. Second, subjects reported the age at which they started smoking cigarettes, and this self-reported measure might not be accurate. Third, the prevalence of female smokers was very low, so the statistical power in this study was somewhat limited. All these limitations pertain to limited availability of data.

The policy of issuing cigarette vouchers as a tobacco control policy in China may have had the ironic consequence of leading to more smokers. Chinese women traditionally did not smoke, but the free cigarette vouchers, inexpensive prices of cigarettes with vouchers, and lack of information about the health risks of smoking led more female nonsmokers to smoke. Women with low SES were particularly susceptible.

The unintended consequences of cigarette vouchers as a tobacco control policy warrant consideration by policymakers. It is worth noting that Poland implemented a voucher system for rationing cigarettes in 1981. Subsequently, the number of smokers increased by more than 1 million from 1981 to 1982, although the overall supply of cigarettes did not change.[20] Cuba still uses a rationing system for cigarettes.[21–23] Rationing of cigarettes has also commonly occurred during periods of tobacco shortages or war.[24,25] Such rationing policies should consider the implications, not only for the amount of cigarettes consumed, but for smoking initiation rates.

**Table 3.** Multivariate logistic regression estimates of the odds of smoking initiation during the voucher period

| Variables | OR | *p*-value |
|---|---|---|
| Female gender | 4.75 | <0.01 |
| Age in 1960 | 0.84 | <0.01 |
| Had a regular job in any part of lifetime | 0.99 | 0.94 |
| **Education level** | | |
| Less than primary school | Reference group | |
| Primary school | 1.20 | 0.28 |
| Lower-middle school | 1.58 | 0.03 |
| Upper-middle school | 1.72 | 0.03 |
| College | 3.05 | <0.01 |
| **Interaction terms with female gender[a]** | | |
| Female * Had a regular job in any part of lifetime | 0.31 | <0.01 |
| Female * Primary school | 0.51 | 0.14 |
| Female * Lower-middle school | 0.20 | 0.04 |
| Female * Upper-middle school | 0.17 | 0.03 |

[a]No female smokers in our sample had a college education, so there is no interaction term between female smokers and college.

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